SHOWCASING SPACE

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Artefacts series: studies in the history of science and technology

In growing numbers, historians are using technological artefacts in the study and interpretation of
the recent past. Their work is still largely pioneering, as they investigate approaches and modes of
presentation. But the consequences are already richly rewarding. To encourage this enterprise, three
of the world's greatest repositories of the material heritage of science and technology: the Deutsches
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Each volume treats a particular subject area, using objects to explore a wide range of issues related to
science, technology and medicine and their place in society.

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Series preface

With the rise of formal academic programmes in the history of science and technology over the last half century, the hope was occasionally expressed that these new scholars, as they developed new traditions, would turn to artefacts, carefully preserved in both public and private museums, as fodder for their research appetites. With some notable exceptions, this has not proven to be the case. Even those scholars who entered museums as curators have produced only a modest number of publications where historical conclusions depend on analysis of the collections.

The situation was aggravated as museums changed in the late twentieth century. Some responded to calls for improvement in science education, turning themselves wholly or partly into science/technology 'centres'. Others responded to trends in the academic community, developing exhibits that placed science and technology in broader social contexts. In the former case, if they were used at all, objects appeared as symbols or icons. In the latter case the pressure to develop social-history approaches has too frequently meant that museum curators look to academia not only for theoretical structures but also for suggestions on where to find supporting evidence, and objects end up as illustrations for the text rather than as fundamental sources.

It was in this environment that the first 'Artefacts' conference took place in 1996. Representatives from the Science Museum, the Deutsches Museum and the Smithsonian met with colleagues from other museums and from academia. We hoped that through formal presentations and through discussion we might begin to develop models for how objects can be used effectively in historical studies. The results would appear in book-length publications (stimulated by the meetings, but not formulated as 'proceedings'). Each meeting, and each volume, would focus on a particular topic.

Now, ten years later, volumes on the topics of medicine, electronics, transport, images and the military have already been published. Space is therefore the sixth topic to be covered.

In the decade since the enterprise began, its context has changed for the better. Museums have come to work more often with the academic history of science, technology and medicine to interpret together the symbolic and the instrumental qualities of artefacts. It has become clear that engagement with artefacts can stimulate new stories as well as unearthing new facts. In many of the papers published through this series, the problem rather than just the solution has been raised by the history or even the presence of a

single relic. Nurturing the trend to such a rich and varied use of
artefacts in the histories of science, technology and medicine is the
challenge taken up by this series.

Each volume also contains a section treating museums that
feature the subject being considered. This indicates the wealth of
material that has been preserved in collections, and the extent to
which it is being used for various levels of interpretation in exhibits.
While typically discussion of exhibitions has emphasised design and
communication, we hope that these contributions will stimulate
debate too on the intellectual underpinning of the use of material
culture in museums.

Martin Collins

Introduction

What stories might space artefacts tell? Do they speak for themselves?
Or do they, in David Noble's oft-referenced turn of phrase, represent
'frozen history' – a dense sediment of human agency, culture and
technology?[1] And, more particularly, as products originating (primarily)
in Cold War culture, do space artefacts pose historiographic questions
and issues different from those posed by artefacts with other histories?

Within the history of science and technology, the questions above
reflect a long-standing concern with the artefact as a theoretical problem
– as a focal point for creating models of technical change and, more
broadly, for creating models that provide a comprehensive framework for
understanding the intersection of technical and cultural change. History
of science and technology, of course, are not the only disciplines with an
interest in the artefact as a site of inquiry.[2] For traditional anthropology
and material culture studies, the artefact has long been an entrée into
exploring the meanings and practices associated with particular cultures.
Artefacts may illuminate a culture through the details of their creation
and use (materials, craft skills, exchanges, rituals) as well as through their
associated symbolism. History of science and technology have drawn
on these methodologies, but with the addition of a unique concern:
to investigate how over the last 500 years science and technology have
become the pre-eminent means for understanding and controlling
nature, and thus a crucial form of social power. From this vantage,
scientific–technical objects – from laboratory instruments to nuclear
reactors and rockets – stand as important markers, evidence and enablers
of this profound transformation.[3] In the 1970s, science and technology
studies used this insight to cast the artefact in a specific, critical
theoretical role – as the nexus through which one could comprehend
both technical and cultural change. These methodologies offered a kind
of unified theory of micro- and macro-history, of the details of the 'act of
invention' in the laboratory or technical project and the larger frame of
culture. Superficially, this historiographic turn seemed a kind of alliance
between internalist and externalist perspectives of the 1950s and 1960s.
Yet it started from a distinct assumption: that science, and by extension
technology, through their methods of producing knowledge, not only
generated claims about what the world is and how it works but were
forms of social power as fundamental as politics, religion or economics in
understanding the making and changing of culture. In short, explaining
scientific, technical and cultural change were fundamentally related
tasks. Science, technology and culture were 'co-produced', taking shape
together through the artefact, none the simple effect of the other's cause.[4]

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How might space artefacts – as museum objects, as focuses of historical inquiry – fit into this evolving historiographic discussion? They are, for the most part, products of a particular milieu – the Second World War, the Cold War and the emergence of state-sponsored big science and technology projects.[5] In recent years, private markets and corporations have established a new (but overlapping with the state-based model) context for creating space technologies. In either context, situated within the complex institutional and technical environment of a 'big' project, space artefacts pose interesting challenges: What is the relationship between a given artefact and the larger project? What are the possible ways in which artefacts, projects and culture intersect? Does the artefact in and of itself offer the opportunity for insights into technical or social change that other interpretative angles might not?

Two features of big technology that are particularly true of space efforts complicate the status of the artefact. One is the strategies of project management that have been central to missile and space-technology undertakings. The creation of technologies in this context pertains not only to a confluence of problem definition, design, research, development, testing and production, but also to a highly-structured, detailed system of managerial control and documentation that coordinates and describes these activities. This project-management culture is an inseparable part of the structure of big technology projects – indeed, it too can be conceived as a technology – and may be regarded as organically part of the artefacts produced through a project. Posed another way, this circumstance raises the question of what counts as 'an' artefact within the context of the project and in what fashion might the historian define and relate a project's components.[6]

Another closely-related feature of big technology that complicates the meaning of space artefacts is the *idea* of the project. As a Cold War construct, the project is a conceptual and practical instrument – a means for the state or a group of states to organise resources that are dispersed geographically and institutionally and to focus them on the solution of particular problems. A range of government entities, of corporations acting as prime and subcontractors, and universities may channel expertise in and through a project. To reach its specific objective (whether a missile, satellite, instrument or subsystem) the project alters social boundaries and tends to de-centre the work and contributions of individual teams or research sites. The assumption of the older historiography was that the act of invention was a local phenomenon, a concentration of problem, inventor and material culture at a given site. The Cold War-style project raises questions of how to characterise the actors and places through which artefacts are created and how these relationships may be reflected in the artefact.[7] These questions take on added significance as the US-developed project template was adapted, for example, in the multinational programmes created in Europe and as the market rather than the

state began to organise big-technology space projects at the end of the Cold War.

In addition to these structural and conceptual features, Cold War big-technology artefacts also represent a distinctive relationship among science and engineering expertise, innovation and problem-solving. As research and development initiatives (another Cold War conceptual category), space artefacts often never were fully settled entities in a design or material sense. Typically, projects posed technical problems that required extensions in the state of the art (say, in the creation of or processing of materials) or in how scientific principles applied to understanding design or performance of an artefact (say, the behaviour of electronics in space). In many cases, artefacts proceeded through iterations of design, development and test, with the artefacts undergoing constant revision – the creation of stable, settled technologies was more the exception than the rule. This circumstance was intimately connected with the larger political culture of the project: state sponsors placed a high value on innovation and state-of-the-art performance. This contingent, fluid situation at the working level bears more scrutiny – as a means to understand the context and details of innovation and their connection to the Cold War culture.

The importance of governmental political acts in creating and sustaining big technology projects has made the programme history seem the natural and key methodological approach to explicating the Cold War fusion of technology and state interests. In this genre, the artefacts and the specifics of innovation are subsidiary to politics and management. Recent historiographic perspectives that see the artefact as a uniquely crucial site for exploring the co-production of culture and technology implicitly shift the emphasis of the programme history away from high-level politics and toward the multifaceted terrain of 'ground-level' engineers and managers. But as the points above on big technology and artefacts suggest, this methodology, too, faces challenges in comprehending the Cold War experience and space artefacts.[8]

These historiographic issues cycle back to the museum in several ways. Might artefacts created through the contexts of big technology or the Cold War serve as evidence in studying the interaction of technology and culture in the twentieth century? If they do, given the above observations, then in what ways? And do different national contexts, international frameworks of collaboration and the turn to the market offer distinctive insights on the workings of space-oriented big technology? From the curatorial perspective, are the detailed historiographic analyses of artefacts associated with big technology compatible with contemporary museum presentation standards – standards that favour concision and simplicity over elaborate explanation? If not, then in what ways do museums and academic history collaborate in developing histories of the signature developments and contexts of technology over the last several decades?

There is one area of technology and culture in which museums and academia have a significant common interest – the ways in which artefacts become identified with cultural values and ideas. Notions of progress and national prestige, and ideals associated with exploration and the frontier, are often integral to the cultural framework through which space artefacts are produced and through which they are perceived by a variety of publics. Indeed, identifying artefacts such as rockets as space rather than military artefacts is a way to invoke one set of cultural associations and submerge another. Museums are bound up in this terrain of cultural interpretations in ways that academia is not. As civic institutions, technology museums often seek to embody and reflect the cultural assumptions of their publics, as well as occasionally engage in the academic task of subjecting these assumptions to critical reflection. For this reason, in recent scholarship, the museum itself increasingly has become an object of study to understand its social role in linking technology with particular values and ideas.[9]

The essays in this volume are grouped into two sections. The first highlights the artefact in its historical dimension, as a crossroad between scholarship and museum purpose. The second shifts the focus to give priority to issues of display, of exhibition as a dynamic expression of professional practice and the cultural values of museum personnel, audiences, patrons and nations. Both sets of essays map onto the historiographic discussion above in different ways.

In the artefacts essays, the transnational landscape of the Cold War takes centre stage as the material and conceptual framework that establishes the history and meaning history of two artefacts – Astris and Black Arrow R4 – and a historic site, the Woomera Test Range. The US advantage in space technology, the importance of that technology in the Cold War and in international relations, and the intention of Europe and the British Commonwealth to compete as well as cooperate with the US were essential context for these artefacts. Astris, the third-stage rocket for the ELDO A launcher, in Helmuth Trischler's account, reveals the complex ways in which West Germany, between the 1950s and 1970s, used state-sponsored technology as a signature means to link innovation policy and practices, notions of European multistate cooperation, US relations, and to interrelate concepts of the market, the civilian and the military. Doug Millard explores similar terrain in Great Britain's development of the Black Arrow R4 rocket, giving special emphasis to the artefact as a site for understanding the overlapping and diverging of British and US interests. Kerry Dougherty draws Australia into this complex cultural Cold War geography, examining the Woomera Test Range's role in launching British, European and US rockets. Each highlights the importance of national context in drawing out historical meaning.

Select aspects of the US and USSR experience, from the Cold War to its aftermath, are represented in essays by Philip Scranton, Asif Siddiqi

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and myself. Scranton's contribution on the Mercury spacecraft explores a defining element of the US pursuit of technological innovation in the Cold War – state sponsorship of the 'cutting edge' through contract to industry – but with specific attention to the organisational and engineering environments thus created at local sites. The result was a specific Cold War style of innovation and engineering practice – chaotic, fluid and constantly experimental. For the USSR, Siddiqi's essay shifts the focus to the post-Cold War era, as loosened state controls gave rise to a social and political competition to shape perceptions of the history of Soviet space achievement. Museums, artefacts, publications (especially memoirs of participants) and auctions in the West served as flashpoints in defining past and present. The transition to the post-Cold War era also is the focus of my own essay. I examine the move to market-based big technology initiatives in the emerging era of globalism, as seen through the Iridium venture, a system of satellites providing a worldwide cellular telephone service.

All of these essays highlight the challenges of distilling complex artefactual histories in ways that meet the practical limitations of display as well as integrate with the museum as multipurpose cultural institution. Historical meaning and explanation vie, often unsuccessfully, with the museum's role in presenting narratives of progress, national celebration and in reinforcing symbols of national identity. Judging from the essays, such narratives are a deep and common aspect of presentations in national museums and prevail across differences in culture and social context.

The exhibition chapters in the volume delve further into this problem. Cathy Lewis's essay offers comparative insight on space artefacts as cultural symbols in the US and USSR in the 1960s, tracing the two nations' active promotion of their respective space accomplishments in international fairs and expositions, as well as their efforts to secure the recognition of such accomplishments in museums. (Her essay should be read as a complement to Siddiqi's account.) David DeVorkin turns the focus from the international to the personal, as he provides insight into the curatorial work of planning and executing a major exhibition, 'Explore the Universe', at the Smithsonian's National Air and Space Museum. Professional commitments to his subject matter, history of astronomy, jockeyed with a variety of constraints – practical, organisational, political (themes that are also touched upon in Doug Millard's Black Arrow essay). Anthropologist Brian Durrans reminds us of the rich cultural associations of 'space' – including the divine and popular media concepts – that visitors overlay on space displays and challenges museum professionals to attend to this cultural interplay and re-examine the inclination to emphasise the technological. Finally, the volume concludes with a select international list, compiled by Brian Nicklas, of museums that feature space exhibitions – a schematic of the state of the art.

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This volume seeks to explore the meaning of space artefacts – as products of particular historical milieus, national and international, and as windows on the historiographic challenges of understanding artefacts and technological and cultural change. It also seeks to examine the distinct vantages of museums and academic history in explicating and presenting space artefacts. The goal of the essays is to see these challenges through a range of cases that highlight differences and commonalities across technologies, institutions, professional communities, projects and national contexts.

Notes and references

1 Noble, D, *Forces of Production: A Social History of Industrial Automation* (New York: Knopf, 1984)

2 Material objects and artefacts still remain active sites of scholarly inquiry. Recent examples include Brown, B, *Things* (Chicago, IL: University of Chicago Press, 2004), Daston, L, *Things That Talk: Object Lessons from Art and Science* (New York: Zone Books, 2004), and Baird, D, *Thing Knowledge: A Philosophy of Scientific Instruments* (Berkeley, CA: University of California Press, 2004).

3 For a sampling of anthropological, material-culture and history-of-technology perspectives on the study of artefacts, see Kingery, W D (ed.), *Learning from Things: Method and Theory of Material Culture Studies* (Washington DC: Smithsonian Institution Press, 1996).

4 A classic expression of these points is contained in Latour, B, 'Give me a laboratory and I will raise the world', in Knorr-Cetina, K and Mulkay, M (eds), *Science Observed* (London: Sage Publications, 1983), pp141–70. Good and comprehensive reviews of the positions and implications of the science and technology studies literature are Golinski, J, *Making Knowledge Natural: Constructivism and the History of Science* (Cambridge/New York: Cambridge University Press, 1998); Jasanoff, S (ed.), *States of Knowledge: The Co-production of Science and Social Order* (London: Routledge, 2004); and Pestre, D, 'Thirty years of science studies: knowledge, society and the political', *History and Technology*, 20 (2004), pp351–69.

5 Not insignificantly, the shifts in historiography noted above occurred nearly contemporaneously with these developments, reflecting an increased scholarly interest in articulating the relationship between politics and scientific and technical knowledge production.

6 The issues raised here parallel in part the concept of system advanced by Thomas Hughes in his study of electrical networks in the late nineteenth and early twentieth centuries. Cold War big technology projects through their development of new managerial methods of control and description raise deeper questions about the relationships between specific artefacts and the large social-technical structures of which they are a part.

7 As with the related point in note 6, this characteristic of big technology is not unique or without precedent. It is an important feature in the rise of large firms in the nineteenth century and common to most contemporary technologies. The Cold War did, it may be argued, intensify and push experimentation with this kind of social organisation for technology.

8 An important example of this tension between programme- and artefact-centred history is MacKenzie, D, *Inventing Accuracy: An Historical Sociology of Nuclear Missile Guidance* (Cambridge, MA: MIT Press, 1990).

9 For an important review of the intersection of history and museum studies, see Starn, R, 'A historian's brief guide to new museum studies', *American Historical Review*, 110 (2005), pp68–98.